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**Impact du degré de prématurité sur la fonction
respiratoire à 36 semaines d'aménorrhée évaluée par
oxymétrie**
Aurélie Poquet

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UNIVERSITÉ CLERMONT AUVERGNE
UFR DE MÉDECINE ET DES PROFESSIONS PARAMÉDICALES

THÈSE D'EXERCICE

pour le

DIPLÔME D'ÉTAT DE DOCTEUR EN MÉDECINE

par

POQUET, Aurélie

Présentée et soutenue publiquement le vendredi 11 octobre 2024

**Impact du degré de prématurité sur la fonction respiratoire à 36 semaines d'aménorrhée
évaluée par oxymétrie**

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Président du jury :

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Figure 1. Representation of the impact of neonatal factors on TSU 90% evaluated by multivariate analysis.

Figure 2. Correlation between TSU 90% and terms of stop of the scope (a) and discharge from hospitalization (b) in <28 WA group (in red), 28-32 WA group (in green), and >32 WA group (in blue).

Liste des abréviations :

ANC: antenatal corticosteroid

BiPAP: bilevel positive airway pressure

BPD: bronchopulmonary dysplasia

BW: birth weight

CPAP: continuous positive airway pressure

CS: corticosteroid

HF O₂: oxygen therapy with high-flow nasal glasses

HMD: hyaline membrane disease

HR: heart rate

IV: invasive ventilation

IVH: intraventricular hemorrhage

LF O₂: low-flow oxygen therapy

NEC: necrotizing enterocolitis

NIV: non-invasive ventilation

PDA: patent ductus arteriosus

ROP: retinopathy of prematurity

TSU 90%: time spent under 90% saturation

TSU 80%: time spent under 80% saturation

TSU 70%: time spent under 70% saturation

WA: week of amenorrhea

Abstract

Background: The identification of apnea and intermittent hypoxia is essential for the management of preterm infants. Oximetry seems to be an interesting tool in this perspective, by evaluating from a recording of saturation over several hours, in particular the average saturation and the time spent under 90% saturation (TSU 90%), markers of intermittent hypoxia.

Objectives: Our main objective was to compare the TSU 90% at 36 week of amenorrhea (WA) according to the degree of prematurity of newborns. As secondary objectives, other parameters from oximetry at 36 WA were compared and determinants of our results sought.

Methods: Newborns benefited from nocturnal oximetry over several hours at 36 WA +/- 2 days. Data were collected to define our population (birth data, events occurring during hospitalization, characteristics at the time of oximetry and subsequent evolution) and the oximetry results compared according to the degree of prematurity.

Results: Sixty-five newborns were included (8 born before 28 WA, 16 between 28 and 32 WA and 41 after 32 WA). The TSU 90% was longer in newborns born before 28 WA compared to newborns born between 28 and 32 WA and those born after 32 WA (5.81 [2.64; 8.04] vs 3.28 [1.48; 5.3] vs 1.9 [0.84; 3.92] respectively, $p = 0.033$). The average saturation was 96.61% in our population, without difference between groups. The duration of noninvasive ventilation was the only determinant of TSU 90% after multivariate analysis.

Conclusion: The TSU 90% at 36 WA is a parameter affected by the degree of prematurity.

Key word: Oximetry, time spent under 90% saturation, average saturation, premature newborns.

Impact of the degree of prematurity on the respiratory function at 36 weeks of amenorrhea assessed by oximetry

Introduction

Every year, over 13.4 million newborns are born prematurely around the world (1), i.e. before 37 weeks of amenorrhea (WA), causing significant infant morbidity and mortality. Extreme preterm is less than 28 WA, very early preterm birth is between 28 and 32 WA, and moderate preterm occurs between 32 and 37 WA. These premature births interrupt fetal development. Consequently, the newborns show immaturity in multiple system particularly in their respiratory and cerebral function leading at the occurrence of apnea often of mixed origin (central and obstructive) and drops in oxygen saturation levels (2–4). In the longer term, this immaturity can lead to the development of one of the most feared pulmonary complication: the bronchopulmonary dysplasia (BPD). This condition is related to a defect in alveolar-capillary development that results in a chronic respiratory failure (5). These complications can require respiratory support, even oxygen therapy occasionally, and therefore a precise monitoring of the saturation. Indeed, maintaining saturation in specific targets is essential in premature infants to limit both the adverse effects of hyperoxia such as retinopathy of prematurity (ROP) (6,7) but also of hypoxia with risks of serious cardio-respiratory complications, difficulties of weight gain (8), and in the longer term neurodevelopmental disorders (2,3,9–11).

As children mature according to the age-corrected term, desaturations become less frequent (2). The weaning from ventilatory support becomes then a challenging aspect of their care. Currently, the guidelines suggest conducting oximetry recording over several hours from 36 WA in BPD patients with the use of two parameters: average oxygen saturation and the percentage of time spent under 90% of saturation (TSU 90%), reflecting apneas and desaturations (12). Weaning from ventilatory support is considered validated when the respiratory function of the newborn is sufficiently mature to maintain an average saturation greater than or equal to

93% and a TSU 90% less than or equal to 5% (12). These recommendations target patients with BPD but could be used more widely to assess the respiratory stability of newborns at 36 WA, especially before discharge home (3,13). However, the interpretations of oximetry recordings, excluding BPD situation, remain poorly described. The studies usually focused on the average saturation and have shown an improvement of this parameter with advancing age of premature newborns, but none has described the TSU 90% in this same population. As the incidence and persistence of apnea have been shown to be inversely proportional to the gestational age at birth (2,3,14), we could suppose that the TSU 90% is also inversely proportional to the gestational age at birth but this has yet to be determined.

Thus, our main objective is to evaluate the respiratory function by oximetry of all premature newborns at 36 WA and to compare the TSU 90% according to the degree of prematurity (term of birth less than 28 WA, between 28 and 32 WA or more than 32 WA) to better understand the natural evolution of respiratory function and consequently adapt our care. As secondary objectives, other parameters from oximetry at 36 WA were compared according to the degree of prematurity and determinants of these results were sought. We hypothesized that 1) the TSU 90% at 36 WA is inversely proportional to the term of birth (more important for those under 28 WA), 2) the average saturation at 36 WA is inversely proportional to the term of birth, increasing with advancing chronological age.

Method

Study population

The study, prospective, included newborns born before 36 WA and hospitalized in neonatal intensive care unit (NICU) or in neonatology unit at the Clermont-Ferrand University Hospital between May 2023 and June 2024. The patients included were followed until their discharge from hospital. All of them were free of brain or pulmonary malformations. The local Ethics Committee (IRB00013412, "CHU de Clermont Ferrand IRB #1", IRB number 2023-CF065),

with compliance to the French policy of individual data protection, approved the protocol for this study.

Neonatal data

Data were collected to define our population (birth data, events occurring during hospitalization, characteristics at the time of oximetry). Hypotrophy was defined by a birth weight below the 10th percentile. The BPD was determined according to the Jobe definition (15), then classified into 3 categories : mild if the infant still had ventilatory support at 28 days of life, moderate if this support lasted up to 36 WA with FiO₂ needs < 30% and severe if these needs were ≥30%. Ventilation was considered non-invasive when OLHD, CPAP or BPAP support was used and invasive when post-intubation mechanical ventilation was required.

Information concerning the evolution of the newborn after the oximetry were also collected (the terms of stop of the scope and discharge from hospitalization in particular).

Study of respiratory function by oximetry

Oximetry recordings

The different parameters of respiratory function were measured overnight using a Masimo Radical-7 or Masimo Radical-7 touch oximeter at a corrected age of 36 WA (+/- 2 days). Sections of recording with poor quality signal were identified and removed manually on the software. Only oximetry reports with a total time of 6 hours or longer of recorded data, after removal of recording with poor signal quality, were included in the analysis.

Oximetry analysis

Several data were collected from the oximetry recordings: average oxygen saturation, 3% drop in saturation, TSU 90%, time spent under 80% saturation (TSU 80%), time spend under 70% saturation (TSU 70%), desaturation index, average heart rate (HR), minimum average HR. The

primary outcome was the TSU 90%. Recommendations for the management of BPD (pathological values were defined as TSU 90% was of 5% or more and the average saturation was less than 93%) (12) were used to define pathological oximetry.

Statistical analysis

Data are expressed as numbers and percentages, N (%) for qualitative variables, and as means (standard-deviation) or medians and interquartile range [Q1; Q3] for quantitative variables, according to the statistical distribution. The assumption of normality distribution was analyzed using Shapiro-Wilk test.

To study the dependence of two qualitative variables, the Chi2 test or Fisher's exact test were applied (depending on the number of participants). To compare two groups (TSU 90% in two categories) based on a quantitative variable, the Student or Wilcoxon tests were applied according to the statistical distribution. To compare more than two groups (terms in tree categories) based on a quantitative variable, the Anova or Kruskal Wallis tests according to the statistical distribution were applied.

A significant result meant a difference between at least two groups. Post-hoc tests were therefore carried out using the appropriate tests. Multiple risk correction was applied for pairwise comparisons using the Fisher test, and following the significant results of the Kruskal Wallis test, the Dunn test was applied.

To determine which variables are significant predictors of TSU, linear regression analyses were performed. Multiple linear regressions analyses were conducted taking into account the explanatory variables selected on the results of univariate analyses and their clinical relevance. Then, for each model, variables were selected using the Akaike Information Criterion (AIC) to identify the subset of variables that are most informative in explaining the outcome variable. The results will be expressed in terms of regression coefficients and 95% confidence intervals. The goodness-of-fit of the model was evaluated using the adjusted coefficient of determination (R^2).

All analysis was performed with R 4.1.3 software (the R Foundation for Statistical Computing, Vienna, Austria). Statistical tests were carried out for a two-sided type I error at 5%. No correction for multiple testing was applied.

Results

Baseline characteristics of the study population

Characteristic at birth

Sixty-five newborns (8 born before 28 WA, 16 between 28 and 32 SA and 41 after 32 WA) were included. Table 1 shows the main neonatal characteristics of our population. As expected, the BW of newborns born after 32 WA (>32 WA group) was significantly higher than the BW of newborns born between 28 and 32 WA (28-32 WA group), which was significantly higher than the newborns born before 28 WA (<28 WA group). The percentage of hypotrophic newborns was not statistically different between our groups. The absence of amniotic fluid during pregnancy (anamnios) was found in a quarter of cases in <28 WA and 28-32 WA groups. It did not occur in the >32 WA group. The Apgar score at 10 minutes was significantly lower in <28 WA group, compared to others groups.

Comorbidities

Regarding respiratory comorbidities, 39% of newborns in our study presented with a hyaline membrane disease (HMD) and consequently received surfactant instillation. Subsequently, more than a quarter of newborns developed BPD (28%), most often of a mild form (56%). All newborns in the <28 WA group had a BDP, compared to more than half in the 28-32 WA group and only 1 child in the >32 WA group.

During their hospitalization, all newborns in the <28 WA group required a support by BiPAP and by HF O₂, all patients in the 28-32 WA group had at least one day of NIV by HF O₂, while only half of newborns in >32 WA group benefited from HF O₂. In addition, the < 28 WA and

28-32 WA groups have significantly longer NIV durations than the > 32 WA group. In line with current recommendations, all newborns born before 32 WA received Caffeine. Other treatments were frequently added in the < 28 WA group (inhaled and systemic corticosteroids (CS) in 75% and 50% of cases respectively, diuretics in 12% of cases). Inhaled CS was used in 25% of newborns in the 28-32 WA group and 2% of newborns in the >32 WA group. No patient born after 28 WA received systemic CS or diuretic.

Other medical complications such as patent ductus arteriosus (PDA), intraventricular hemorrhage (IVH), and sepsis were significantly more frequent in <28 WA group compared to both other groups.

Characteristic during oximetry

At the time of the oximetry, 88% of newborns had no ventilatory support but 20% had Caffeine treatment (38% in < 28 WA group, 19% in 28-32WA group and 17% in >32 WA group) and 3% had inhaled CS (1 in <28 WA group and 1 in 28-32 WA group, none in >32 WA group).

Respiratory function

The data collected with oximetry are presented in table 2. The TSU 90% was significantly longer in the <28 WA group compared to >32 WA ($p = 0.033$) while no inter-group difference was noticed for the TSU 80 %, the TSU 70% and the desaturation index. The median of the average saturation was 97.1% in our population and his average was 96.6%, without significant difference between groups.

Pathological respiratory function profile

The profile of pathological oximetry is presented in table 3. In total 13 newborns had a pathological value of TSU 90% while no newborn had a pathological average saturation. The

presence of pathological TSU 90% was statistically more frequent in <28 WA group, compared to other groups.

Determinants of TSU 90%

Several parameters (presence of hypotrophy, BW and term, Apgar at 10 minutes, BPD, history of sepsis and IV, duration of ventilation in particular duration of NIV, and presence of ventilatory support during oximetry) were found significantly correlated with TSU 90% in univariate analysis. The duration of NIV was the only independent determinant of TSU 90% after multivariate analysis and adjustment to the term of birth, to the presence of treatment with Caffeine and/or ventilatory support during oximetry (table 4, figure 1). Indeed, the duration of NIV was positively associated with TSU 90% (coefficient = 0.11 [0.1;0.2], $p = 0.0001991$).

Respiratory function at 36 WA and clinical evolution

The terms of stop of the scope and discharge from hospitalization were significantly later when the TSU 90% was pathological at 36 WA (table 5). Moreover, moderate but significant correlation was found between TSU 90% and term of stop of the scope ($R = 0.37$, $p = 0.0022$), weaker with the term of discharge from hospitalization ($R = 0.28$, $p = 0.022$) (figure 2).

Discussion

The aim of our study was to compare the respiratory function of premature newborns at 36 WA according to their degree of prematurity and to highlight the potential determinants of our observations. We found that 1) the TSU 90% at 36 WA was significantly longer in the most premature newborns (<28 WA group compared to other groups), 2) the average saturation was not statistically different between groups, 3) the duration of NIV was the only independent determinant of the TSU 90% at 36 WA after multivariate analysis and adjustment.

TSU 90% depending on the degree of prematurity

The TSU 90% represents the number of desaturations or hypoxic episodes that occur during recording and is attributed in premature newborns to the occurrence of apnea or periodic breathing (3,16). The first main result of our study was that the TSU 90% at 36 WA was longer in newborns born before 28 WA compared to other newborns. This result is linked to observations from previous studies which showed that apneas were the clinical manifestation of immature control of breathing, due to central and peripheral chemoreceptor immaturity, and that consequently their presence was inversely associated with gestational age at birth (2,3,14). Several works illustrate these results observing, for example, that newborns born before 32 WA had significantly more apnea at 37 WA than those born between 35 and 36 WA (14) or that newborn late preterm presented more intermittent hypoxemic events than full-term newborns at 40 WA (10). Thus, postnatal maturation, which allows a reduction of hypoxic episodes with increasing age, does not, however, completely correct the initial immaturity of premature newborns when they reach term.

Note that in our study, several newborns, born before 28 WA or after, had a TSU 90% at 36 WA greater than 5%, a threshold considered pathological according to the recommendations for the management of BPD (12). The resolution of apneas after 36 WA having been shown to be associated with worse neurodevelopmental outcome (17), the resulting management of a pathological TSU 90% at 36 WA remains to be clarified.

Average saturation depending on the term of birth

Our second main result was that average saturation was not significantly different between groups of premature newborns. This is an unexpected result since average saturation usually improves with advancing age (10). Here, we do not observe a higher average saturation in group <28 WA, but their initial average saturation is unknown, possibly explaining our observations. Moreover, we hypothesized that the persistence of numerous desaturations in

newborns born before 28 WA (longer TSU 90%) also explains this result. However, their desaturations remain shallow (absence of difference between our groups in the TSU 80% and the TSU 70%).

Determining factors of TSU 90%

Many neonatal parameters have been evaluated as potential factors impacting the TSU 90% in our study. Interestingly, after multivariate analysis and adjustment, only the duration of NIV has been shown to be significantly correlated with TSU 90%, whether there is an associated BPD or not. Pillekamp et al. showed a relationship between the duration of IV and the persistence of apnea in premature newborns (17). Thus, these results confirm that the duration of ventilation (IV or/and NIV) is a marker of neonatal respiratory severity, notably reflecting the intensity of apnea.

The BW and trophicity contrary to another study (17), were not found to be correlated with TSU 90% after multivariate analysis and adjustment, but were correlated in univariate. We can therefore hypothesize that BW has an effect on TSU 90% probably not directly but indirectly through the term of birth. It is also interesting to mention that the mode of delivery, the presence of an infectious risk, the adaptation to extra-uterine life, or the occurrence of complications (PDA, IVH, ROP, NEC, sepsis) were not found to be significantly correlated with TSU 90%.

Oximetric results at 36 WA: predictive factors of neonatal outcome?

In our study we showed the terms of stop of the scope and discharge from hospitalization were significantly later when the TSU 90% was pathological at 36 WA. Thus, the oximetry results by assessing stability respiratory, seem to be able to predict the child's subsequent clinical course. Also, the studies have even shown that the risk of late death or disability at a corrected age of 18 months for extremely preterm infants increased with the percentage of time spent with hypoxemia, defined here by a saturation less than 80% (16). Note that the severity of hypoxemia

added little prognostic value unlike the duration which was more affecting (only those lasting for 1 minute or more were associated with an increased risk) (18). Another study showed that apnea lasting more than 20 seconds, found on recordings after discharge was linked to more subsequent complications and highlighted that observation alone did not correctly assess respiratory stability (events unidentified or omitted) (19). The diagnosis of hypoxemic episodes in a premature newborn reaching term therefore seems to be one of important elements to take into account to improve the prognosis.

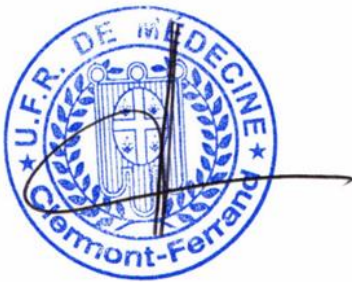
Conclusion

The use of oximetry standardized the ventilatory weaning of patients with BPD but its interpretation in other neonatology situations notably at the key age of 36 WA is less codified. Our study revealed in a population of premature newborns that the TSU 90% at 36 WA was a parameter affected by the degree of prematurity at birth and which was, in some cases greater, than 5%. The average saturation at 36 WA does not differ depending on the term of birth. Further research is required before we can determine which infants should be screened by oximetry (generalization for all premature newborns?) and what management should be proposed in the event of pathological results, particularly in newborns without BDP.

Conclusion :

L'utilisation de l'oxymétrie a standardisé le sevrage ventilatoire chez les patients atteints de dysplasie bronchopulmonaire (DBP), mais son interprétation dans d'autres situations de néonatalogie, notamment à l'âge clé de 36 semaines d'aménorrhée (SA), est moins codifiée. Notre étude a révélé, dans une population de nouveau-nés prématurés, que le temps passé avec une saturation en oxygène inférieure à 90 % (TSI 90 %) à 36 SA était un paramètre influencé par le degré de prématurité à la naissance et qu'il était, dans certains cas, supérieur à 5 %. En revanche, la saturation moyenne à 36 SA ne varie pas en fonction du terme de naissance. Des recherches supplémentaires sont nécessaires avant de pouvoir déterminer quels nourrissons devraient être dépistés par oxymétrie (généralisation à tous les prématurés ?) et quelle prise en charge proposer en cas de résultats pathologiques, en particulier chez les nouveau-nés sans DBP.

**Doyen de l'UFR de médecine,
Professeur Pierre CLAVELOU**



**Président du jury,
Professeur Etienne MERLIN**

A handwritten signature in blue ink, likely belonging to Etienne Merlin, the President of the jury.

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Annexes :

Table 1. Baseline characteristics

Population	All	< 28 WA	29 to 32 WA	> 32 WA	p-value	
	(n = 65)	(n = 8)	(n = 16)	(n = 41)		
Characteristic at birth						
Sex (% boy)	33 (50%)	5 (63%)	9 (56%)	19 (46%)	0.62	
BW (g)	1760.9 (648.1)	883 (159.4)	1218.2 (278)	2143.1 (465.8)	<0.001	
Hypotrophic	10 (15%)	1 (13%)	4 (25%)	5 (12%)	0.66	
ANC	45 (68%)	5 (63%)	13 (81%)	27 (66%)	0.53	
Cesarean	39 (59%)	5 (63%)	15 (94%)	19 (46%)	0.013	
Twin	24 (36%)	1 (13%)	5 (31%)	18 (44%)	0.25	
Amniotic fluid	<i>Anamnios</i>	6 (9%)	2 (25%)	4 (27%)	0	0.002
	<i>Hydramnios</i>	4 (6%)	1 (13%)	0	3 (7%)	
Apgar at 10 minutes	9 [8;10]	7.5 [7;9]	9 [7.75;9]	9.5 [9;10]	0.001	
Infectious risk	34 (52%)	4 (50%)	6 (38%)	24 (59%)	0.36	
Comorbidity						
Respiratory						
HMD	25 (38%)	7 (88%)	10 (63%)	8 (20%)	<0.001	
Surfactant	25 (38%)	7 (88%)	10 (63%)	8 (20%)	<0.001	
BPD	18 (28%)	8 (100%)	9 (56%)	1 (2%)	<0.001	
Stage of BPD	<i>Mild</i>	10 (56%)	4 (50%)	6 (67%)	0	0.36
	<i>Moderate</i>	7 (39%)	4 (50%)	2 (22%)	1 (100%)	
	<i>Severe</i>	1 (6%)	0	1 (11%)	0	
Ventilatory support						
LF O ₂	6 (9%)	1 (13%)	3 (19%)	2 (5%)	0.17	
HF O ₂	45 (69%)	8 (100%)	16 (100%)	20 (49%)	<0.001	
CPAP	5 (8%)	4 (50%)	0	1 (2%)	<0.001	
BiPAP	15 (23%)	8 (100%)	5 (31%)	2 (5%)	<0.001	
IV	17 (26%)	7 (87%)	5 (31%)	5 (12%)	<0.001	
Duration of NIV	6 [0;32]	40 [34.5;42.8]	31 [19.8;44.8]	1 [0;5]	<0.001	
Duration of IV	5 [1;15]	21 [9.5;24]	5 [4;5]	1 [1;3]	0.052	
Respiratory treatment						
Caffeine	51 (78%)	8 (100%)	16 (100%)	27 (66%)	0.003	
Duration of Caffeine	22 [10;41]	66.5 [54.3;74.5]	36 [23.8;43.5]	10 [5;17.5]	<0.001	
Inhaled CS	11 (17%)	6 (75%)	4 (25%)	1 (2%)	<0.001	
Systemic CS	4 (6%)	4 (50%)	0	0	<0.001	
Diuretic	1 (2%)	1 (13%)	0	0	0.12	
Cardiac						
PDA	6 (9%)	5 (63%)	1 (6%)	0	<0.001	
Neurological						

IVH		7 (11%)	3 (38%)	3 (19%)	1 (2%)	0.006
Leucomalacia		1 (2%)	0	1 (7%)	0	0.36
ROP		1 (2%)	1 (13%)	0	0	0.12
Digestive						
NEC		3 (5%)	1 (13%)	1 (6%)	1 (2%)	0.3
Infectious						
Sepsis		16 (25%)	7 (88%)	6 (38%)	3 (7%)	<0.001
Characteristic during oximetry						
Age (days)		22 [11;40]	63 [61.3;72.8]	41 [36;47.3]	14 [6;18]	<0.001
Ventilatory support	<i>None</i>	58 (88%)	5 (63%)	13 (81%)	40 (95%)	0.015
	<i>LF O₂</i>	1 (2%)	0 (0%)	0 (0%)	1 (2%)	
	<i>HF O₂</i>	7 (11%)	3 (38%)	3 (19%)	1 (2%)	
Respiratory treatment	<i>Inhaled CS</i>	2 (3%)	1 (13%)	1 (6%)	0	0.13
	<i>Caffeine</i>	13 (20%)	3 (38%)	3 (19%)	7 (17%)	0.47

Table 2. Respiratory function assessed by oximetry in our population

	All	< 28 WA	28 to 32 WA	> 32 WA	p-value
Respiratory function					
Average saturation	97.1 [95.3;97.8]	95.5 [95;97.8]	97.6 [96.1;98.2]	97.1 [95.5;97.8]	0.37
3% drop	40 [21.4;57]	71 [44.7;97.7]	39.7 [20.6;50]	36.2 [20.8;55.7]	0.11
TSU 90%	2.64 [1.06;4.31]	5.81 [2.64;8.04]	3.28 [1.48;5.3]	1.9 [0.84;3.9]	0.033
TSU 80%	0.3 [0.04;0.55]	0.6 [0.14;0.82]	0.36 [0.09;0.67]	0.14 [0.01;0.43]	0.074
TSU 70%	0 [0;0.05]	0.04 [0;0.18]	0 [0;0.1]	0 [0;0.03]	0.52
Desaturations index	31.7 [17.6;44.3]	50.2 [34.3;64.8]	28.4 [17.1;40.3]	29.7 [17.5;43.7]	0.1
Cardiac function					
Average HR	154 [145;159]	154 [152;158]	154 [145;160]	153 [141;158]	0.66
Minimum average HR	76 [52;96]	82 [70;101]	81 [56;98]	65 [50;95]	0.48

Table 3. Profile of pathological oximetry

	All	< 28 WA	28 to 32 WA	> 32 WA	p-value
Pathological TSU 90%	13 (20%)	5 (62.5%)	4 (25%)	4 (10%)	0.003
Pathological average saturation	0	0	0	0	

Table 4. Explanatory factors of TSU 90% in univariate then multivariate analysis

		Coefficient	p-value
Univariate analysis			
Sex	<i>Boy</i>	1.17 [0;2.3]	0.0506
Tem	<28 WA	2.81 [1.1;4.6]	0.00201
	28-32 WA	1.02 [-0.3;2.3]	0.131
Trophicity	<i>Hypotrophic</i>	1.88 [0.3;3.5]	0.0236
	<i>Macrosomia</i>	0.44 [-2.4;3.2]	0.755
BW		-1.5 [-2;-1]	0.00109
Antenatal corticosteroid		-1.24 [-2.5;0]	0.0543
Mode of delivery	<i>Cesarean delivery</i>	-0.32 [-1.6;1]	0.619
	<i>Instrumental delivery</i>	-1.54 [-4.5;1.4]	0.305
Infectious risk		0.17 [-1;1.4]	0.775
Apgar score at 10m		-0.74 [-1.3;-0.2]	0.00502
BPD		2.84 [1.7;4]	0.000053
NEC		0.21 [-2.7;3.1]	0.885
Sepsis		1.49 [0.1;2.8]	0.0308
IVH		1.13 [-0.8;3.1]	0.245
IV		1.65 [0.3;3]	0.0142
Duration of NIV		0.07 [0;0.1]	0.000030
Duration of IV		0.03 [-0.1;0.2]	0.657
Age at oximetry		0.05 [0;0.1]	0.000642
Ventilatory support at oximetry		1.93 [0.2;3.7]	0.0331
Caffeine at oximetry		-0.85 [-2.3;0.6]	0.261
Multivariate analysis			
Duration of NIV		0.11 [0.1;0.2]	0.0001991
Ventilatory support at oximetry		-0.32 [-2.2;1.6]	0.734
Caffeine at oximetry		-1.33 [-2.6;-0.1]	0.0401
Tem	<28 WA	-0.93 [-3.3;1.5]	0.442
	28-32 WA	-1.93 [-3.7;-0.1]	0.0381

Table 5. Clinical evolution in function of TSU 90% at 36 WA

	All	Normal TSU 90%	Pathological TSU 90%	p-value
Scope stop term	37.4 [36.9;38.6]	37.3 [36.7;38]	38.3 [37.3;40.1]	0.03
Discharge term	38 [37;38.7]	37.6 [36.9;38.6]	38.6 [38;40.3]	0.058

Figure 1. Representation of the impact of neonatal factors on TSU 90% evaluated by multivariate analysis

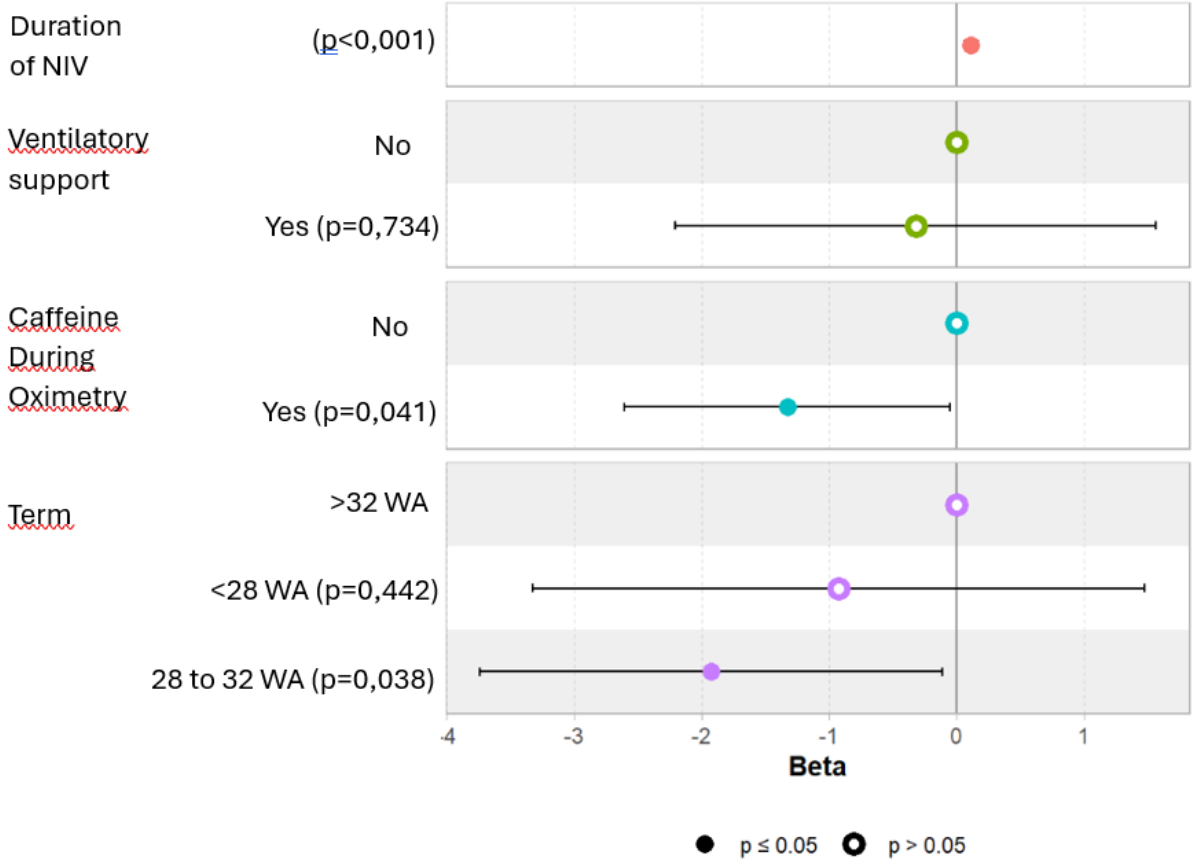
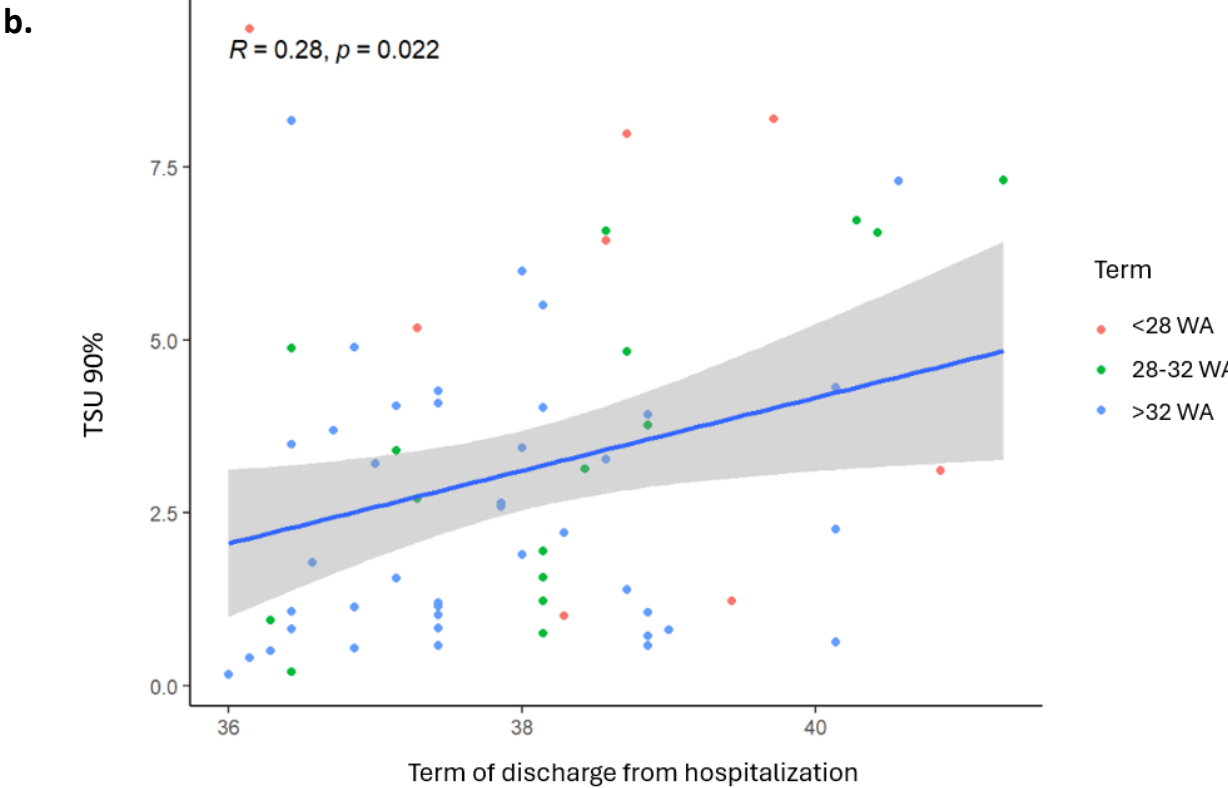
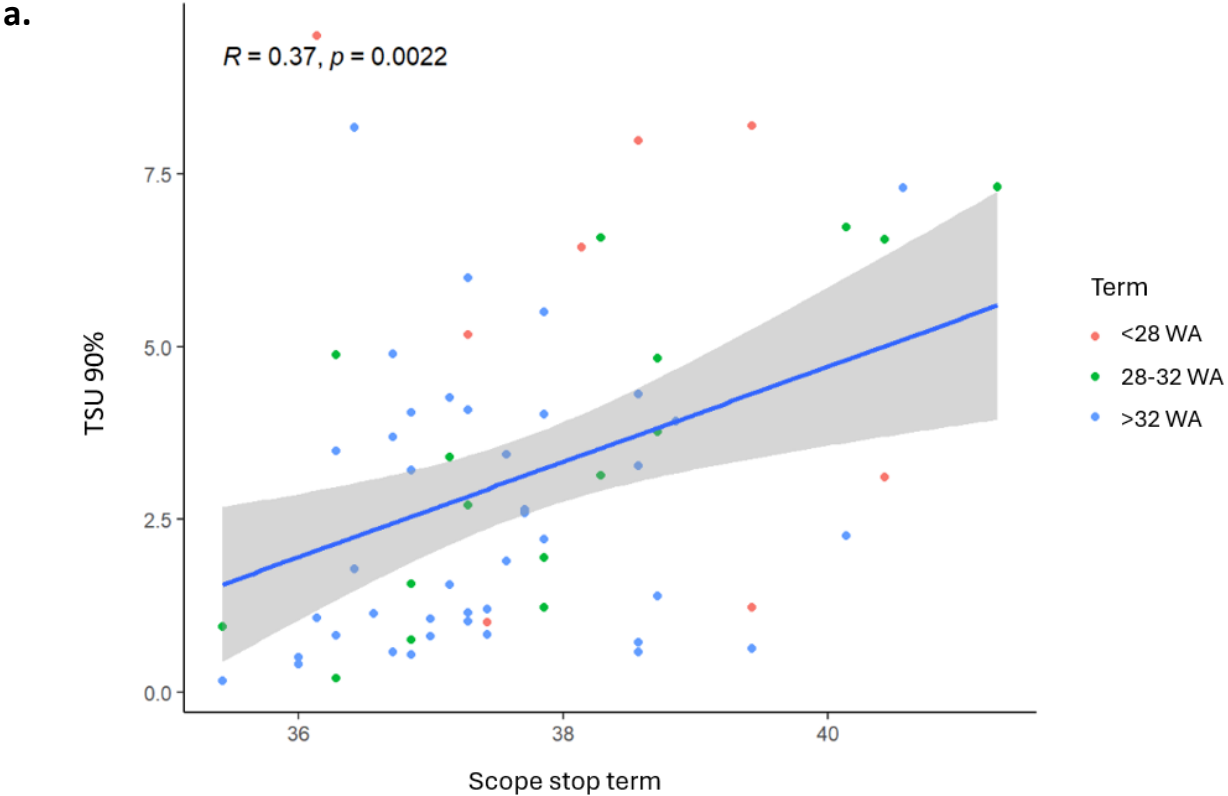


Figure 2. Correlation between TSU 90% and terms of stop of the scope and discharge from hospitalization



(Conseil national de l'ordre des
médecins)SERMENT
D'HIPPOCRATE

Au moment d'être admis(e) à exercer la médecine, je promets et je jure d'être fidèle aux lois de l'honneur et de la probité.

Mon premier souci sera de rétablir, de préserver ou de promouvoir la santé dans tous ses éléments, physiques et mentaux, individuels et sociaux.

Je respecterai toutes les personnes, leur autonomie et leur volonté, sans aucune discrimination selon leur état ou leurs convictions. J'interviendrai pour les protéger si elles sont affaiblies, vulnérables ou menacées dans leur intégrité ou leur dignité. Même sous la contrainte, je ne ferai pas usage de mes connaissances contre les lois de l'humanité.

J'informerai les patients des décisions envisagées, de leurs raisons et de leurs conséquences.

Je ne tromperai jamais leur confiance et n'exploiterai pas le pouvoir hérité des circonstances pour forcer les consciences.

Je donnerai mes soins à l'indigent et à quiconque me les demandera. Je ne me laisserai pas influencer par la soif du gain ou la recherche de la gloire.

Admis(e) dans l'intimité des personnes, je tairai les secrets qui me seront confiés. Reçu(e) à l'intérieur des maisons, je respecterai les secrets des foyers et ma conduite ne servira pas à corrompre les mœurs.

Je ferai tout pour soulager les souffrances. Je ne prolongerai pas abusivement les agonies. Je ne provoquerai jamais la mort délibérément.

Je préserverai l'indépendance nécessaire à l'accomplissement de ma mission. Je n'entreprendrai rien qui dépasse mes compétences. Je les entretiendrai et les perfectionnerai pour assurer au mieux les services qui me seront demandés.

J'apporterai mon aide à mes confrères ainsi qu'à leurs familles dans l'adversité.

Que les hommes et mes confrères m'accordent leur estime si je suis fidèle à mes promesses ; que je sois déshonoré(e) et méprisé(e) si j'y manque.

Nom, Prénom

Signature

SERMENT D'HIPPOCRATE

En présence des Maîtres de cette FACULTE et de mes chers CONDISCIPLES, je promets et je jure d'être fidèle aux lois de l'Honneur et de la Probité dans l'exercice de la Médecine.

Je donnerai mes soins gratuits à l'indigent et je n'exigerai jamais un salaire au-dessus de mon travail. Admis dans l'intérieur des maisons, mes yeux ne verront pas ce qui s'y passe, ma langue taira les secrets qui me seront confiés et mon état ne servira pas à corrompre les mœurs ni à favoriser le crime.

Respectueux et reconnaissant envers mes MAÎTRES, je rendrai à leurs enfants l'instruction que j'ai reçue de leurs pères.

Que les HOMMES m'accordent leur estime si je suis fidèle à mes promesses. Que je sois couvert d'OPPROBRE et méprisé de mes confrères si j'y manque.

Nom, Prénom

Signature

Résumé :

Introduction : L'identification de l'apnée et de l'hypoxie intermittente est essentielle pour la prise en charge des nouveau-nés prématurés. L'oxymétrie semble être un outil intéressant dans cette perspective, en évaluant, à partir d'un enregistrement de saturation sur plusieurs heures, notamment la saturation moyenne et le temps passé sous une saturation de 90%, des marqueurs de l'hypoxie intermittente.

Objectif : Notre objectif principal était de comparer le temps passé sous une saturation de 90% à 36 semaines d'aménorrhée (SA) selon le degré de prématurité des nouveau-nés. Comme objectifs secondaires, d'autres paramètres de l'oxymétrie à 36 SA ont été comparés et les déterminants de nos résultats recherchés.

Méthodes : Les nouveau-nés ont bénéficié d'une oxymétrie nocturne sur plusieurs heures à 36 SA +/- 2 jours. Les données ont été collectées pour définir notre population (données de naissance, événements survenus pendant l'hospitalisation, caractéristiques au moment de l'oxymétrie et évolution ultérieure), et les résultats de l'oxymétrie ont été comparés selon le degré de prématurité.

Résultats : Soixante-cinq nouveau-nés ont été inclus (8 nés avant 28 SA, 16 entre 28 et 32 SA et 41 après 32 SA). Le temps passé sous une saturation de 90% était plus long chez les nouveau-nés nés avant 28 SA comparé à ceux nés entre 28 et 32 SA et après 32 SA (5,81 [2,64 ; 8,04] vs 3,28 [1,48 ; 5,3] vs 1,9 [0,84 ; 3,92] respectivement, $p = 0,033$). La saturation moyenne était de 96,61% dans notre population, sans différence entre les groupes. La durée de la ventilation non invasive était le seul déterminant du TSU 90% après analyse multivariée.

Conclusion : Le temps passé sous une saturation de 90% à 36 SA est un paramètre influencé par le degré de prématurité.